PROBLEMS.

359. *By George Lilley, A. M., Corning, Iowa.*—Find the greatest and least number of balls of equal diameter (radius r) that can be put in a given box, a feet long, b feet wide and c feet high.

360. *By Tho's Spencer, Meriden, Conn.*—Prove, of all spherical triangles of equal area, that of the least perimeter is equilateral.

361. *By John H. Christie, State College, Pa.*—A right cone, radius of base R and altitude a, is pierced by a cylinder whose radius is r, the axis of the cylinder intersecting the axis of the cone at right angles and at a point whose distance from the vertex of the cone is b. Required the solidity common to the cone and cylinder.

362. *By E. B. Opdycke, Pulaski, Ohio.*—A section of an embankment is a feet long; the top width of both ends is b feet; the width of the ends at bottom is c and d feet, respectively, and the corresponding depths of the ends are e and g feet. Develop a Rule, and give the contents.

363. *By Prof. W. W. Johnson, U. S. Naval Acad., Annap., Md.*—The tangent at one end of a chord of an ellipse is parallel to the line joining the other end with a fixed point within the ellipse. Show that the area of the locus of the middle point of the chord is one half the area of the ellipse.

364. *By W. E. Heal, Marion, Ind.*—Discuss the curve whose equation is $x = \log[y+\sqrt{(y^2-1)}]$, and find its area and length.

365. *Selected, By Prof. H. T. Eddy, Cincinnati, Ohio.*—Show that

$$\int_0^{\frac{1}{2}\pi} \frac{\sqrt{(1-c)}\,.\,d\theta}{1-c\cos^n\theta} = \frac{\pi}{\sqrt{(2n)}}$$

when c is indefinitely nearly equal to unity, n being a positive quantity.

366. *By R. S. Woodward, Detroit, Mich.*—What is the probable error in a system of errors (y) given by the equation

$$\begin{aligned} y = {} & a_1\cos(rz+\beta_1)+ \\ & a_2\cos(2rz+\beta_2)+ \\ & \cdot\quad\cdot\quad\cdot\quad\cdot\quad\cdot \\ & a_n\cos(nrz+\beta_n), \end{aligned}$$

wherein a_1, a_2, etc., β_1, β_2, etc., and r are constants, and all values of z are equally likely?

367. *By Prof. Simon Newcomb, Wash., D. C.*—Prove the equation

$$\begin{aligned} \log\left(1-\frac{2\eta}{1+\eta^2}\cos x\right) &= -\eta^2+\tfrac{1}{2}\eta^4-\tfrac{1}{3}\eta^6+\text{ etc.} \\ &\quad -2\eta\cos x-\tfrac{1}{2}2\eta^2\cos 2x-\tfrac{1}{3}2\eta^3\cos 3x-\text{etc.} \\ &= \sum_{i=1}^{i=\infty}(-1)^i\frac{\eta^{2i}}{i}-\sum_{i=1}^{i=\infty}\frac{2\eta^i}{i}\cos ix. \end{aligned}$$